Retinopathy of Prematurity

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Retinopathy of Prematurity (ROP) is a disorder of altered retinal vasculature occurring in low birthweight infants (1250 grams or less). These vascular abnormalities evolve over time and may progress through stages. ROP may result in permanent visual disability or blindness.[1]

The Committee for the Classification of ROP identified the five basic stages of vascular and retinal abnormalities.[2] Embryologically the retinal vasculature begins at the optic nerve and grows anteriorly in the retina toward the ora serrata, the anterior insertion of the retina. The geographic growth of the retinal vasculature is divided into Zones. Zone 1 is twice the distance of the radius beginning from the optic nerve extending to the macula. Zone 2 is the radius from the optic nerve extending to the nasal ora serrata. Zone 3 extends from the anterior border temporally of Zone 2 to the temporal ora serrata. The vascular abnormalities are classified by Stages. Stage 1 ROP shows terminal vascular arborization with a terminal line (whitish-gray thread-like line) separating vascularized from avascular retina. In Stage 2 ROP the line becomes a ridge with definite thickness and broadness. In Stage 3 there is fibrovascular proliferation along the surface of the retina and into the vitreous. If the vessels exiting the optic nerve are tortuous and dilated this is known as "Plus" Disease. Stage 4a is partial retinal detachment not involving the macula whereas Stage 4b involves the macula. Stage 5 is total retinal detachment of the vascularized retina. This results in a funnel-shaped detachment.[3] Of premature infants weighing less than 1250 gm at birth 25.2% develop Stage 1, 21.7% develop Stage 2, and 18.3% develop Stage 3.[4] "Plus" disease can progress through Stage 1 and 2 quickly thus necessitating frequent ocular exams in the neonatal ICU. Although most ROP regresses, it can exacerbate thus requiring continued monitoring until full vascularization of the retina.

The Japanese report on regression of ROP following ablation of the peripheral avascular retina prompted a prospective randomized clinical trial comparing observation alone to cryoablation.[5,6] The eyes reaching Threshold for surgery had "Plus" disease with five continuous hours or eight total clock hours with Stage 3 in Zone 1 or 2. The operated eyes had a 31.1% unfavorable result compared to 51.4% in the control group.

With the advent of better laser surgery delivery systems, it became possible to ablate the peripheral avascular retina with laser surgery. A prospective randomized study was not feasible. The Laser-ROP Study Group combined three large laser studies and determined equal efficacy to cryosurgery.[7] There is indication that laser surgery for Threshold Disease in Zone 1 may have better result than cryosurgery. Laser surgery carries significantly less morbidity than cryosurgery. Hawaii has had laser capability for ROP disease for some time. This significantly reduces the risk of Threshold ROP progressing to retinal detachment.

Those eyes progressing to retinal detachment can be operated with scleral buckle operation. Scleral buckle reduces progression from Stage 4 to Stage 5 ROP.[8] Vitrectomy surgery can help in severe Stage 5 ROP although the visual result has not been very gratifying. Much work needs to be done to obtain better vision results in these advanced cases and to prevent progression to this level..

With new technical and pharmacological advances the low birthweight infant is increasingly surviving and we need to be watchful for the incidence of ROP is increasing.[9] Newer research initiatives continue to look for ways to prevent or resolve ROP to reduce vision loss. Animal studies show that too much oxygen given shortly after birth causes ROP.[10] However, animal studies also demonstrate that too little oxygen later can make ROP worse if it already exists.[11] The STOP-ROP Study (Supplemental Therapeutic Oxygen for Prethreshold), funded by the NIH, is registering infants with marginal arterial oxygenation and "Prethreshold" ROP disease. Kapiolani Medical Center for Women and Children is one of the clinical trial centers. This study will determine if supplemental oxygen will reduce the number of infant eyes progressing to Threshold ROP. STOP-ROP is also examining the effects of supplemental oxygen on infant growth rate, pulmonary disease, and length of stay. Hopefully, this study will definitively answer the question as to the role of Oxygen administration in the development of ROP.

Retinopathy of Prematurity requires ongoing research to determine its multifactorial causes and the best ways to prevent and halt its potentially devastating end result of blindness.

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